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Regenerator unit 32 includes a receiver 34 for receiving signals from XTU_{co} 18, a decoder 36 for analog-to-digital conversion and decoding of the payload of the received signals into base digital data, and a buffer 38 for temporarily storing the base data. Receiver 34 includes a suitable time generator for extracting the timing of the incoming signals when an ATM protocol is used. An encoder 40 then reforms or repackages the data from buffer 38 into XDSL line signals, and a line driver retransmits the encoded signals onto the distribution line. A similarly arranged receiver 44, decoder 46, buffer 48, encoder 50, and line driver 52 are provided for regenerating signals transmitted on line 30 from an XTU_{cust} 28 to XTU_{co} 18.